



Sheet # 4

(E-R Diagram)

1. The Hudson Engineering Group (HEG) has contacted you to create a conceptual model whose application will meet the expected database requirements for its training program. The HEG administrator gives you the following description of the training group's operating environment:

The HEG has 12 instructors and can handle up to 30 trainees per class. HEG offers five "advanced technology" courses, each of which may generate several classes. If a class has fewer than 10 trainees in it, it will be canceled. It is, therefore, possible for a course not to generate any classes during a session. Each class is taught by one instructor. Each instructor may teach up to two classes or may be assigned to do research. Each trainee may take up to two classes per session.

Given this information, do the following:

- a. Draw the E-R diagram for HEG.
 - b. Describe the relationship between instructor and course in terms of connectivity, cardinality, and existence dependence.
2. Create a Crow's Foot ERD for each of the following descriptions. (Note that the word "many" is meant to mean "more than one" in a database modelling environment.)
 - a) Each of the MegaCo Corporation's divisions is composed of many departments. Each of the departments has many employees assigned to it, but each employee works for only one department. Each department is managed by one employee, and each of these managers can manage only one department at a time.
 - b) During some period of time, a customer can rent many videotapes from the BigVid store. Each of the BigVid's videotapes can be rented to many customers during that period of time.
 - c) An airline can be assigned to fly many flights, but each flight is flown by only one airline.
 - d) The KwikTite Corporation operates many factories. Each factory is located in a region. Each region can be "home" to many of KwikTite's factories. Each factory employs many employees, but each of these employees is employed by only one factory.
 - e) An employee may have earned many degrees, and each degree may have been earned by many employees.
 3. Pick and Shovel Construction Company is a multi-state building contractor specializing in medium-priced town homes. Assume that Pick and Shovel's main entities **are its customers, employees, projects and equipment**. A customer can hire the company for more than one project, and employees sometimes work on more than one project at a time. Equipment, however, is assigned to only one project at a time. Draw an ERD showing those entities.

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4. FastFlight Airlines is a small air carrier operating in three north-eastern states. FastFlight is in the process of computerizing its passenger reservation system. The following data items have been identified: reservation code, flight number, flight date, origin, destination, departure time, arrival time, passenger name, seat number, reservation agent number and reservation agent name. For example, flight number 303, which is scheduled every Tuesday and Thursday, leaves Augusta, Maine, at 9:23am and arrives in Nashua, New Hampshire at 10:17am. You can assume that the Fast Freight reservation system will detect automatically whether empty seats are available. Draw the Entity Relationship Diagram for this system.
5. Prepare an Entity Relationship Diagram for Patty's Daycare Centre. For each entity indicate the primary key by underlining attribute(s) making up primary key and also specify 1 additional significant attribute. Identify and label significant relationships between pairs of entities (either 1:1, 1 : M or M:N).

Patty's Playschool is a child daycare center. A parent registers their child or children at the school using a registration form. A **parent** can submit more than one **registration form**. Each room in the daycare is assigned an age group. For example an infant is under 1 year of age and toddlers are from 1 to 3 years of age. A **child** is assigned to a room based on their age and availability of space. A **room** may be assigned one or more **employees**. An employee can only be assigned to one room. The minimum number of employees required for a room is determined by the number of children assigned to the room and the child:staff ratio identified by the government. For example one employee can care for 5 infants or 8 toddlers.
6. A large bank operates several divisions. Information Technology (IT) is operated as one of these divisions. Within the IT division are many departments that are managed by one manager, and all IT employees belong to one of these departments. The IT division assigns its employees to one or more on going projects in the bank. A project may be planned, but not have any employees assigned to it for several months. Each project will have a single employee assigned who acts as a project leader.
7. A hardware store sells several home workshop products to the public (such as power saws and sanders). Each product has several different manufacturers who manufacture it, and prices are different for products made by different manufacturers. Each time one or more products are sold to a customer, an invoice is created which lists the date, items purchased and their prices, and then the total purchase and tax amounts.
8. The Ministry of Transportation (MOT) supplies **department** keeps track of all the items (furniture and equipment such as a chair or printer) in the Ministry offices. There are several MOT **buildings** and each one is given a different **name** to identify it. Each **item** is assigned a unique ID when it is purchased. This ID is used to keep track of the item, which is assigned to a room within a building. Each **room** within a building is assigned to a department, and each department has a single **employee** as its manager.

Sheet # 4 (Cont.)

9. A cooking club organizes several dinners for its members. The purpose of the club is to allow several members to get together and prepare a dinner for the other members. The club president maintains a database that plans each meal and tracks which members attend each dinner, and also keeps track of which members create each dinner.
Each dinner serves many members and any member is allowed to attend. Each dinner has an invitation. This invitation is mailed to each member. The invitation includes the date of the dinner and location.
Each dinner is based on a single entrée and a single dessert. This entrée and dessert can be used again for other dinners.
10. ABC Consulting is a small-sized consulting firm in the IT industry. ABC's business is managing several Systems Development projects by assigning staff consultants to these projects as their skills are needed. Each employee is designated to have one primary skill, but there may be other employees with the same primary skill. A consultant may work on one or more projects, or may not yet be assigned to a project.
The company charges for each project by billing each consultant's hours worked by the billing rate. The hourly billing rate is dependent on the employee's primary job skill.
11. A company purchases products and sells them to its customers. Each time a sale occurs, an invoice is created listing the customer name, and a list of purchase product descriptions, the supplier name for the products, and the price of each product. The product number identifies each product and will appear again if another customer purchases the same product. Each supplier can supply many products which we can sell, but each product has only one supplier.
12. You are asked to create a database to produce a report of customer details. The report is to list the customer name, account balance, credit limit, and other customer details. The report will also list the customer account rep (one of our sales employees). Our sales reps manage many customers each, but each customer will be managed by only one account rep at any one time. However, your design should allow for customer's being managed by many account reps as it is possible that some of our employees may leave the company - thus, requiring new account reps for a customer.
13. A company operates a warehouse parts supply business. The company has several warehouses located in Toronto which each store several hundreds of automotive parts. We need to keep a record of how many parts are "on hand" - meaning inventory levels that tell us how many we have for each part. To help us organize our parts, each part is assigned a specific classification. There are 4 classifications that we use to organize hundreds of parts.
14. To keep track of office furniture, computers, printers, and so on, the FOUNDIT company requires the creation of a simple database. Each piece of office furniture, computer or printer is given an identification number. Each item is then placed in a room of one of three buildings. The building manager is responsible for the items in their building.

*With best wishes,
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